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Towards Learning Excellence in Universities: A Critical Review of Information and Communication Technology Policies in Education in Kenya.

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ABSTRACT

The current reality is that technological advancement has shaped how learning is being conducted in education. Communication technology has been embraced in education by both educators and learners. However, the embracement has been slow, and this was experienced during the Coronavirus (Covid-19) pandemic, when teaching and learning had to shift and relied heavily on communication technology, but in actuality educational institutions were not ready. The virus continues to linger on and has served as a wake-up call for the education sector. This therefore makes Information and Communication Technology (ICT) an essential component in education today, not only to be implemented during crises, but also due to technological advancement and stakeholders' needs in the current times. Governments have made efforts to integrate ICT in education, as is the case in Kenya. This paper reviews the National ICT policy in Kenya since its formulation in 2006 and its revision in 2019. These two policies were national, and education was integrated into the policies. However, in 2021, an additional policy on ICT in education and training was formulated and will also be analysed in this study. The paper analyses the strategies and implementation in higher learning institutions and outlines the barriers and challenges experienced in its implementation. Accessibility and equity have been pinpointed as some of the major factors influencing ICT integration. As higher learning institutions focus on blended or hybrid learning, ICT becomes a fundamental tool to facilitate education. The paper makes recommendations based on the policy inadequacies and how to focus on ICT in education for future meaningful impact.

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Introduction and Aims

During Covid-19, higher learning institutions had to undertake a sudden shift from the physical classroom learning environment to an online learning environment. Some higher learning institutions had already embraced advancement into online communication and education technology way before the pandemic, but others were not equipped to shift online. This has led to the debate regarding the current education system in its entirety. Firstly, the current system is built on first and second industrial revolution (IR) models which advocate for memorization and standardization (Seldon & Abidoye, 2018; Krishnan, 2020). According to Sifuna (1998), these models may have been successful in the past as there was positive correlation between university education and the reward structure in formal employment, but Kirui and Sang (2020) argue that rethinking the quality and relevance of higher learning education is paramount. Students are also increasingly questioning university education, the value of which is progressively viewed in terms of future career readiness and economic value (Krishnan, 2020). Secondly, with the adoption of online learning, which could have a permanent impact on the education system even after the pandemic, questions arise regarding accessibility and equity. Accessibility to learning educational technology platforms in sub-Saharan African countries is a challenge due to issues around internet penetration and digital literacy. These challenges regarding technology, equipment, and internet costs raise questions regarding inclusion and fairness. This paper seeks to critically review the education policies in Kenya. Considering that teaching and learning had been taking place online due to the Covid-19 pandemic, this review will focus on ICT in education policies and higher education institutions.

Given the Covid-19 pandemic, the role of ICT in education policies has gained prominence. In education, ICT is viewed as the usage of computers, the internet, and other electronic delivery systems that enhance learning (Fu, 2013). In Kenya, the national ICT policy was revised in 2019, based on the one formulated in 2006, where the priority was on supporting and promoting the development of e-learning resources (Barasa, 2021). According to the Kenyan Ministry of Education (MOE), ICT is defined as any "Communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems, among others, as well as the various services and applications associated with them, such as video conferencing and distance learning" (MOE, 2021: xii). ICT implementation is meant to contribute to better education, improved digitalization and innovation, and equity in education. It is therefore necessary to evaluate if higher education institutions in Kenya have been able to implement the policy, considering that

Nairobi, Kenya, is one of the leading ICT innovation hubs in Eastern Africa (Souter & Kerretts-Makau, 2012). This study aims to critically review the three policies and will also focus on the opportunities and challenges experienced regarding accessibility and equity.

With the shift caused by Covid-19, institutions of higher learning have not only experienced challenges with ICT, but also the advancement of technology for online learning has rendered face-to-face teaching and learning redundant in some respects. According to the World Economic Forum, online learning has led to increased retention of knowledge and is time efficient (Li & Lalani, 2020), while others believe that online learning is unreliable due to lack of accessibility to technology and the internet, especially on the part of marginalised students or students from low-income families (Organization for Economic Co-operation and Development (OECD), 2021). Most institutions are now adopting blended or hybrid learning; however, regardless of whether most learning takes place face-to-face or online, ICT is a component that cannot be neglected or ignored. Kenya is one of Africa's fastest growing ICT markets (National ICT Policy, 2019). According to the Economic Survey 2021 report, during Covid-19, there was increased demand for internet connectivity and online learning expanded across the country (Kenya National Bureau of Statistics (KNBS), 2021) due to the MOE encouraging online teaching and learning in higher education institutions. This led to an increased uptake of most digital services.

The objective of this study is to analyse the ICT in education policy in Kenya in the light of technological uptake in higher learning institutions. To further analyse the policy, the study will focus on how equity and accessibility are catered for in the policy. The findings will contribute to the transformation of ICT in education policy and pedagogy in higher learning institutions. This will contribute to teaching and learning beyond Covid-19 and prepare the education sector for future shifts.

In Kenya, there were two national ICT policies as of 2019. The first one was formulated in 2006, while the second one was in 2019. In these two policies, education was integrated into the national policies as a component but did not exist on its own. The policies were all inclusive, with the national economic agenda at the centre (National ICT Policy, 2019). In 2021, a new policy was formulated, which focused on ICT in education and training.

The First ICT Policy in Kenya

In Sessional Paper No. 1 of 2005, the government of Kenya acknowledged the importance of an ICT literate workforce. Education was recognised as a platform for equipping the nation with ICT skills. However, instead of formulating an ICT in education policy, a National ICT policy framework was drafted and ICT in education was part of the country's wider policy framework. This means that, as a country, there is no ICT in education policy, but education is a component in the national ICT policies. Educational institutions were considered instrumental in using ICT for education, research and training, management, and dissemination of skills to the country. The policy framework incorporated ICT in both government offices and educational institutions. The development of the framework also attracted partnerships with international organizations. These partnerships would assist in the dissemination of ICT, even in rural areas (Republic of Kenya, 2005).

The mission of the 2006 National ICT Policy was "to improve the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services" (National ICT Policy, 2006:1). The Policy documents add that, by 2005, Kenya had 73 registered Internet Service Providers (ISPs), with approximately 1,030,000 active internet users. Youth were identified as the largest user population, who could afford and utilise the appropriate ICTs. In the policy, the challenges pointed out in achieving ICT potential were inadequate infrastructure, lack of comprehensive policy and regulatory framework, and finally, insufficient skilled human capital. Inadequate infrastructure was to be addressed by providing support infrastructure such as energy, supporting software development, and promoting and providing incentives for local manufacture of ICT equipment. The regulatory framework was to ensure affordable and accessible ICT, privacy matters, support research and development, and an institutional framework for policy development and review, while the human capital challenge was to be addressed by promoting ICT education and training for teachers, setting up frameworks for training and certification, and coming up with mechanisms that would attract and retain skilled human resources.

The 2006 National ICT Policy also acknowledged that, due to the above-mentioned challenges, electronic learning (e-learning) and universal access, which are the main drivers of use of ICT in education, were not attained. To achieve the benefits of e-learning, it was thus necessary for the government to provide affordable and adequate infrastructure for knowledge and skill dissemination, promote content development, inter-institutional sharing of resources, integration of e-learning resources, and create awareness of ICT benefits as an educational tool. Content

development, especially in local languages, was encouraged as it leads to knowledge sharing, expression of ideas, and preservation of the languages. It was noted that access to ICT was limited to urban areas, yet most of the population lived in the rural areas. To resolve this, the Universal Service Fund was established to address universal access. The Fund was to ensure the creation and promotion of ICT benefits, requisition and provision of adequate resources, and incentives to encourage ICT deployment in rural areas.

As has been mentioned above, in Kenya the ICT policy is national, therefore it applies to the whole government, which includes educational institutions. In the introduction of the 2006 ICT policy, the document addresses ICT first, followed by an IT (information Technology) section. The difference between the two is not clearly stated, but rather implied in the areas of focus. In the ICT section, the policy focuses on communication infrastructure, such as the numbers of telephone lines, broadcasting stations, internet users and mobile cellular providers, while in the IT section, the policy focuses on advancement in the field of IT to focus on human and trade development, employment, productivity, and efficiency (National ICT Policy, 2006).

The ICT section addresses the status and statistics of ICT in Kenya, the policy and regulatory framework bodies, and the challenges experienced in the ICT national development. Focusing on the challenges related to ICT in education, these include lack of comprehensive policy and regulatory framework, inadequate ICT infrastructure, insufficient skilled human resources, lack of a policy framework on e-learning, limited universal access to ICT services, need for an enabling environment for public-private partnerships, underdevelopment of local content, gender issues in relation to specific developmental needs of women, and lack of affordable and appropriate ICT services for the youth, who are the largest population in Kenya. These are clearly mammoth challenges. One of the strategies identified to tackle the universal access to ICT in education challenge was to use a portion of the Universal Service Fund to diffuse ICT knowledge. This was to be done by the establishment of a national ICT Centre of Excellence, which would promote capacity building and innovation with nationwide coverage. The policy concludes that to achieve the implementation of the ICT framework objectives, the government would provide a leadership role and work with the different stakeholders (development partners, users, investors); the government role being development, implementation and co-ordination of the ICT policy, regulation and licencing, dispute resolution, and finally, the provision of an enabling environment for investment by the stakeholders.

The IT section addresses the policy objectives and strategies and states that information is a resource that needs to be generated, collected, organised, and preserved for national prosperity (National ICT Policy, 2006). Narrowing down to some of the IT objectives related to education, they include ensuring that IT is used to empower the youth, both male and female genders, in both rural and urban areas, improving the quality of teaching and learning by encouraging the use of IT in educational institutions, and facilitating the development of IT policies and strategies for e-education. The IT strategies in the 2006 policy that relate to education included the provision of adequate and reliable internet infrastructure, and e-learning. The 2006 policy breakdown of e-learning strategies is as follows:

a) Promote the development of e-learning resources
b) Facilitate public - private partnerships to mobilise resources in order to support e-learning initiatives
c) Promote the development of an integrated e-learning curriculum to support ICT in education
d) Promote distance education and virtual institutions, particularly in higher education and training
e) Promote the establishment of a national ICT Centre of Excellence
f) Provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms
g) Promote the development of content to address the educational needs of primary, secondary, and tertiary institutions
h) Create awareness of the opportunities offered by ICT as an educational tool to the education sector
i) Facilitate sharing of e-learning resources between institutions
j) Exploit e-learning opportunities to offer Kenyan education programmes for export; and
k) Integrate e-learning resources with other existing resources (National ICT Policy, 2006: 12-13).

The policy indicated that, to achieve the stated IT objectives in education, it would promote ICT growth and implementation of the above e-learning strategy.

The 2019 ICT Policy in Kenya

In 2019, the government of Kenya prioritised the use of IT and accordingly revised the ICT policy of 2006, leading to the development of the 2019 National ICT Policy (Barasa, 2021). The review was done as an important element in addressing and aligning to the new constitution, the current dynamic technological advancement and changes, as well as in achieving Kenya's Vision 2030 development goals and objectives (National ICT Policy, 2019). The new mission was "to facilitate universal access to ICT infrastructure and services all over the country" (National ICT Policy, 2019:6).

Though the 2019 mission is similar to the 2006 mission, as it seeks to ensure availability, accessibility, affordability, and reliable ICT services, the 2019 mission seems to target equality and the implementation phases of ICT services for all Kenyans.

The focus areas of the 2019 Policy include speeding up the development of new generation mobile phones, high internet speed, secure and global ICT infrastructure, implementation of big data strategy, amongst others. Some of the policy objectives include the creation of internet infrastructures that allowed high speed, wireless connection, support big data, the Internet of Things and machine learning, 10% growth in Gross Domestic Product (GDP) through ICT-generated income, innovation and global opportunities by the year 2030, and enhancement of educational skills that support innovation and start up ecosystems. Compared to the 2006 Policy, the focus areas in 2019 seem to tackle ICT issues from a notch higher, in that they are aligned to the technological advancement occurring. In other words, the 2006 Policy was about putting non-existing ICT infrastructure in place, while the 2019 Policy was about advancing the technology.

To achieve the 2019 Policy objectives, one of the focus areas was 'Mobile First'. This was key, as most students access the internet through mobile phones. Therefore, there was a need for affordable internet on mobile devices (National ICT Policy, 2019). The emphasis was on achieving a knowledge-based society by ensuring the availability and accessibility of efficient, reliable, and affordable ICT technology and internet services, and enhancement of education institutions with skills to foster innovation. This was similar to the 2006 Policy. Additionally, with the new technological changes, there were increased ICT services, high demand for speed and quality services, and the government invested heavily in internet connectivity infrastructure.

Another important area highlighted in the 2019 Policy was skills and innovation. The Policy acknowledged that the technological world is advancing at a rapid speed, and that it was paramount for the country to align its educational requirements to meet both local and global markets. To achieve the uptake of skills and innovation development, the 2019 Policy placed emphasis on collaborations between higher learning institutions and the private sector (National ICT Policy, 2019). One of the private-sector organisations that collaborates with the MOE is the Kenya Education Network Trust (KENET). KENET is a not-for-profit organisation that was established to promote and support ICT in higher learning institutions (KENET, 2021). Its mandate is to support and enhance research and education technology services with cost-effective, reliable, and fast internet connectivity (KENET, 2021). The National ICT 2019 Policy indicates that the advancement of ICT

development is necessary to take advantage and remain competitive in the Fourth IR (4IR). Some of the initiatives include the introduction of high-speed internet and network infrastructure, and investment in digital devices funded by the MOE and technology partnerships with private agencies and organisations (National ICT Policy, 2019). The implementation of the policy would promote e-learning and integrate e-learning into the curriculum. the 2006 policy mentions the importance of developing frameworks to attract partnerships. The 2019 policy actualises these partnerships.

Kenya's Vision 2030 aims to create a globally competitive environment with three main pillars: economic, social, and political, which enhance equity and wealth creation opportunities. ICT policy falls under the economic pillar as it supports socio-economic transformation. Kenya's Vision 2030 would be achieved through "[an] economic and institutional regime that utilises existing knowledge; creation of new knowledge and entrepreneurship; educated and skilled population; dynamic information and communication infrastructure that facilitate[s] processing and dissemination; and [an] effective innovation system and research" (National ICT Policy, 2019:9). How this affects the ICT policy is that there were new legal frameworks in place, such as the new Constitution of Kenya in 2010, the Kenya Information and Communication Act 2013, and the Media Act 2013, which required the harmonization of ICT policies in order to compete in the international and global space, thus content generation, technological advancements, and increased demand for bandwidth, as previously discussed, were important factors. These are areas that were not highlighted in the 2006 Policy as they had not been experienced in the ever-changing ICT space.

Policy on ICT in Education and Training - 2021

In 2021, education and training were separated from the National ICT Policy 2019 in Kenya. The new ICT in Education and Training Policy, 2021 states that, "Education Management Information Systems (EMISs) have been developed to mainstream data management for informed decision-making" (MOE, 2021:v). The MOE saw the need to invest in education that was equitable and accessible to all. The 2021 ICT Policy offers a framework of bridging the digital divide, implementing ICT in education, and acts as a tool for curriculum delivery and education management. The Policy states that, according to The National Education Sector Strategic Plan (NESSP), 2018-2022, institutions would use ICT as a pedagogical tool to enhance education. The Policy is divided into seven chapters, which include: background and situation analysis, legal contexts and objectives, policy provision, which includes equity and access, amongst others, resource mobilization and partnerships,

monitoring and evaluation, governance and ICT management, and the final chapter focuses on the institutional policy implementation framework.

In the situation analysis chapter, the 2021 Policy notes that, back in 2006, access to ICT facilities was a major challenge, with a ratio of one computer to 150 students in Africa, compared to most developed nations, which was one to 15 students, while in Kenya, the ratio in higher learning institutions was one to 45 students (MOE, 2021). By 2013 the ratio of personal computers (PCs) had reduced to 3.8 for every 100 students, with 30.7% of students being able to access computers from home, while 53% of the students had PCs (KENET, 2017). However, in their 2013 e-readiness survey, KENET found that only 17% of the campus students accessed computers from their campuses. By 2018, 76.8% of the educational institutions had access to ICTs (MOE, 2021). Some of the challenges mentioned in the national policies of 2006 and 2019 were to be addressed in the 2021 Policy. They include enhancing access to ICT infrastructure, providing appropriate digital resources, increasing capacity of qualified and requisite human resources, and enhancing research and innovation. The strategies are highlighted in the 2021 Policy chapters.

In the legal and policy context, the 2021 Policy addresses legal provisions in the Constitution of Kenya and different Acts. According to the Constitution of Kenya, every Kenyan has the right to education (MOE, 2021). All the Acts related to education can be summarised to provision, promotion, development, management, and governance of education through the integration of ICT. The policy context aims to achieve improved access to ICT infrastructure, capacity training of human resources, and regulation and implementation of ICT strategies in educational institutions. The guiding principles for the policy context include inclusion and equity, quality and relevance, integrity, transparency and accountability, collaboration, diversity, professionalism, and research and innovation. This study focuses on inclusion and equity and the guiding principles define it as "ICT to address needs of all learners, including those with special needs, disabilities, the vulnerable and the hard to reach", and diversity, which is defined as "[to] ensure that all learners of different backgrounds, abilities and talents access ICT services (MOE, 2021:8-9).

Chapter Three analyses the guiding principles for ICT in education and training and offers strategies for the principles. In the inclusion and equity principle, in addition to the already mentioned challenges in the 2006 and 2019 National ICT Policies, are insecurity, lack of awareness, students accessing inappropriate content, and negative attitudes towards ICT in education and training. To address this principle, the objectives and strategies support inclusive access to ICTs at all levels of

education and training, which can be achieved by providing a comprehensive and systematic ICT infrastructure. This would include promoting and developing local ICT education solutions such as making software affordable, assistive, and adaptive technologies for all learners, including learners with disabilities, and national education data centres. Additionally, these would enhance the existing remote learning opportunities such as using radio and television broadcasts, adhering to regulations on cybercrimes, and utilising and developing mobile applications. There would also be promotion and adoption of blended, remote and distance, and e-learning approaches. Of interest is that the principle addresses mechanisms and management of obsolete ICT infrastructure, yet at the same time inadequate and limited ICT infrastructure is a challenge.

All the ICT Policies in Kenya have the strategies that need to be worked on to realise and implement ICT in education. In the 2021 Policy, the institutional framework section focuses on effective implementation. The MOE would have the overall responsibility of overseeing the implementation by working with the relevant ministries, departments, agencies, county governments, development partners, and key stakeholders (MOE, 2021). Different committees, such as National Steering, Inter-Agency Technical Implementation, ICT Integration Units, County ICT Implementations, and Institutional ICT, were formed to oversee the implementation of the policy. Each committee's role was stipulated, and they were to report periodically to the MOE. The reports would contribute to the monitoring, evaluation, and reporting, which is the final section in the policy. This final section is viewed as critical, and is evidence based, which would contribute to ensuring the effective use of ICT in education, identification of gaps, and contribute to future improvements of the policy.

Higher Education Institutions and ICT in Education in Kenya

Even before the Covid-19, there was high demand for online learning platforms and educational technology (Insider & Insider, 2019). During the pandemic, higher education institutions have had to improve their content and teaching and learning methodologies. One of the strategic goals is promoting Open and Distance Learning (ODEL), which includes the integration of ICT into e-learning pedagogies (Barasa, 2021). As previously indicated, the government, through the Ministry of Education, Science and Technology (MOEST), saw the benefits of ICT in education as offering new opportunities for teaching, learning, and training, whereby teaching would be student centred, go beyond physical class constraints, enable greater collaboration for both teachers and students, and make use of multiple technologies, all of which would build enthusiasm amongst students (MOEST, 2015). As much as these benefits were acknowledged, there were still major challenges in the

implementation of the ICT policy in the educational institutions, such as high levels of poverty, limited rural electrification and power outages, high costs for both internet and equipment, inadequate infrastructure, and lack of support. Additionally, ICT in education was not categorised into the different levels of learning, such as primary, secondary, and tertiary, based on the Kenyan education system. This could be seen as problematic as different levels require different considerations in terms of infrastructure, integration levels, and competence.

When the 2006 ICT Policy was formulated, the education system in Kenya was based on 8-4-4, where 8 is the number of years in primary level education, 4 years in secondary level education and the final 4 years are in university level education (Kenya Institute of Curriculum Development (KICD), 2017). The 2006 Policy was revised in 2019, and within the new 2021 ICT in Education and Training Policy, Kenya changed its education system to a Competency Based Curriculum (KICD, 2017; Nyaboke, Kereri, & Nyabwari, 2021). This new curriculum also changed the education structure to 2-6-6-3, where there are 2 years in pre-primary education, 6 years in primary education, 6 in secondary education, divided into 3 years in junior secondary education and 3 years in senior secondary education, and the last 3 are in higher education or at university level. With the new education system and Vision 2030, the curriculum changes are meant to equip the learner with digital literacy skills and ICT integration throughout their education, unlike the previous curriculum where ICT integration was an elective subject at the secondary level (KICD, 2017).

The Technology Integration Matrix (TIM) is a descriptive tool that can be used to analyse the level of instruction and technology in both primary and secondary level schools (TIM, 2009). It describes the characteristics that enhance a meaningful learning environment. These characteristics include active, collaborative, constructive, authentic, and goal-oriented aspects. The characteristics are further defined based on the level of technology integration to include entry, adoption, adaptation, infusion, and transformation (Hornack, 2011). When the learner starts schooling, education and ICT integration should focus on the entry level, and advance into infusion and transformation as the learner continues to higher learning levels. The Directorate for ICT for Education Technology oversaw the implementation and integration of ICT in teaching and learning. To actualise the benefits and mitigate these challenges, the Directorate needed to provide infrastructure for ICT usage in education and, with stakeholders, formulate strategies to use ICT such as interactive websites and communication channels, train and provide teachers with access and tools to teach, and support e-learning, amongst others. These challenges and strategies are mentioned in the 2006 or and 2019 Policies.

According to the Policy Framework for Education, Training and Research Sessional Paper of 2005, some of the objectives were to increase enrolment in higher education institutions, to integrate ICTs in the curriculum, especially for ODEL, to integrate and train the relevant stakeholders on ICT in teaching, and to develop e-learning networks for promotion and sharing of educational resources (MOE ICT, 2006). The Economic Survey 2021 reports that, as of 2020, Kenya had 31 public universities and 33 private universities, with a total of 509, 468 students enrolled in both public (412,840) and private (96,628) universities in 2019/2020, while in 2020/2021 the provisional enrolment was 546,699 students, an increase of 7.31%. These statistics indicate that the number of higher learning institutions continues to increase, and this expansion in student enrolment is accompanied by an increase in online learning. With the policy implementation, students would be able to access not only infrastructure such as computers but also affordable internet services. This would encourage and build on the spirit of innovation (MOE ICT, 2006), leading to a smooth transition or integration of teaching and learning.

From the beginning, ICT was viewed as a tool that would prepare and enable learners to be competitive and integrate well in the global economy (MOEST, 2015). Additionally, critical thinking and ICT literacy, amongst other skills, are essential for learners in the 21st century. For this to happen, "policy formation, capacity development, digital content and ICT infrastructure are the critical pillars for integration of modern technologies to teaching and learning" (MOEST, 2015: 96). By 2015, over 21,500 teachers and district master trainers had been trained by the MOE on ICT integration in education. There was also continuous deployment of ICT infrastructures in learning institutions through several projects such as NEPAD e-schools, the ESP-ICT Computers for Schools project, the Accelerating 21st Century Education project, the Badiliko project, and the Holistic Model project. These projects have been initiatives between the government and public-private partnerships.

E-learning entails the usage of electronically mediated online asynchronous and synchronous communication to enable learning and teaching (Garrison, 2011). Synchronous online learning utilises ITs to enable course lectures or meetings, while asynchronous online learning utilises computer-based training, where learners can access the course online anytime and learn wherever and at their own pace (Tarus, Gichoya, & Muumbo, 2015). These give the learners options, when available. Additionally, higher learning institutions are now contemplating blended learning. Blended learning entails the use of both face-to-face meetings and online learning to engage and teach students (Tarus *et al*., 2015). Tarus *et al*. add that some institutions partially incorporate blended

learning due to lack of adequate infrastructure and skills. Due to the pandemic, many institutions have found it necessary to utilise e-learning, both synchronous and asynchronous, to meet their students' needs. Two of the factors influencing the utilisation of ICT in learning are accessibility and equity.

Accessibility and ICT Utilisation in Higher Education Institutions

Accessibility to ICT is important for the expansion of education, as it can take place from anywhere with no geographical or time limits (Fu, 2013). Krishnan (2020) defines accessibility as learners having ICT anywhere without limitations, regardless of being in a developed or undeveloped country. Seale and Cooper (2010) support this view by adding that accessibility entails flexibility of e-learning systems, and learning resources that meet the demands and preferences of all the users, regardless of their environment, tools used, or disability. This translates to accessibility to ICT without inequality. Accessibility includes access to computers and the internet, as well as administrative and technical support (Fu, 2013). Accessibility to ICT infrastructure by the students can contribute to learner-centred learning as students are focused and involved in the learning process, especially in asynchronous online learning (Castro Sánchez & Alemán 2011). Brush, Glazewski and Hew (2008) add that accessibility to ICT makes knowledge acquisition possible, engaging, and provides solutions to problems in the learning process. Accessibility is one of the most influential factors on usage of ICT in education but at the same time it is also one of the most overlooked and lacking factors (Chen, 2008; Fu, 2013).

In Kenya, accessibility to ICT entails factors besides computers, internet, and support. Factors such as accessibility to electricity and phone lines or modems, content, and administrative and technical support also need to be considered (Farrell, 2007). Other factors, such as poverty, limited rural electrification, and electricity disruptions, are still on the rise, especially in rural areas. In consideration of these elements associated with accessibility, based on Krishnan's (2020) definition of accessibility, Kenya seems to be falling short. However, in the urban centres, Farrell (2007) notes that there has been a rapid increase in internet users and, therefore, accessibility to ICT. As of June 2021, the internet penetration in Kenya was 55.2% in urban areas and 23.5% in rural areas (Communications Authority of Kenya (CA), 2022).

Mayes and de Freitas (2004) review several e-learning theories that are meant to assist teachers, policy makers, and stakeholders on the pedagogical design framework for e-learning. Greeno, Collins

and Resnick (1996) outline three theoretical levels that can be applied in e-learning. These include the empiricist perspective, which defines learning as an activity, the cognitive perspective, where learning is achieved through understanding, and finally, the situative perspective, which sees learning as a social practice. Empiricist theories or perspectives focus on behavioural elements, where tasks need to be detailed or broken down in such a way that learners experience learning from an individualised level. This would be achieved based on the learners' active responses to tasks and the immediate feedback from their facilitators (Seale & Cooper, 2010). Cognitive theories focus on constructive traditions, where knowledge is acquired through interactions between new experiences and formerly created structures for understanding. In this case learners' skills and experiences are enhanced through the support of resources, both human and machine based. With the cognitive perspective, accessibility is reduced by bridging the gap between the new experiences and former knowledge (Seale & Cooper, 2010). Finally, situative theorists argue that learning is achieved from a contextual view, where learners learn from others and participate in community practices. It places emphasis on interactions between learners.

While it would be necessary to analyse the Kenyan students' experiences using the three theoretical perspectives, it is first important to establish whether the resources have been implemented. Should the current ICT policy adhere to the empiricist perspective, then the higher learning institutions need to make sure that ICT in education technology is adaptive and flexible to achieve accessibility. From the cognitive perspective, the ICT policy needs to focus on skills and innovative elements, ensure that the trainers are equipped and trained to attend to the learners' potential, while in the situative perspective, emphasis is placed on ensuring that the ICT adapts to the environment. In other words, if an institution is implementing blended learning, synchronous or asynchronous online learning, then the learner should experience seamless learning.

In reality, for the National ICT policy, whether empiricist, cognitive, or situative perspectives are being applied, the challenges of ICT education in reference to accessibility are still experienced. In 2006, a survey done by African Tertiary Institutions Connectivity Survey (ATICS) compared the bandwidth capacity of an African university to be equivalent to that of broadband resident connection in Europe, but the cost to be 50 times more expensive (Farrell & Shafika, 2007). In fact, the survey summarised the connectivity to be "too little, too expensive, and poorly managed" (Farrell & Shafika, 2007:10). Nonetheless, internet connectivity and availability have improved. A study done in 2016 showed that 84% of the respondents indicated internet connectivity was good or excellent in their institutions (Nyerere, 2016), adding that some universities have even invested in

providing students with tablets. Partnerships with agencies and private organisations have also contributed by providing better internet connectivity, digital tools, computers, and tablets (Barasa, 2021). Therefore, accessibility should not only focus on the equipment but also on the cost, speed, and internet connectivity.

Equity and ICT Utilisation in Higher Education Institutions

Equity is closely related to accessibility, but it focuses on ensuring that every student has the ICT support needed, fairness, and inclusion (Krishnan, 2020). According to Burgess and Patterson Williams (2022), equity is viewed from fairness, excellence, equality, and social justice perspectives, while Winn (2018) views equity as a situation where one can thrive irrespective of their race, ethnicity, social and economic status, gender, sexuality, or even ability. A similar definition is offered by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2017), which emphasises fairness in education, where all learners have equal opportunities. Therefore, from an educational perspective, equity can only occur when students have equal access to high quality instructions which include curriculum and infrastructure.

UNESCO (2017) advise that when developing policies and, in the case of this study, the ICT in education policy, they need to be inclusive and equitable, which requires that the students' difficulties are catered to. This extends to equality for all students regardless of their geographical location, social and personal background, and/or gender. One of the concepts introduced to tackle equity across universities in Kenya is ODEL (Nyerere, 2016). ODEL ensures accessibility to education for all students despite economic, social, political, and technological aspects, as it advocates for access to education for students in areas of hardship and in remote areas. ODEL affords education to the marginalized and those who cannot attend physical classes and is thus considered as one of the innovations that offers a solution to equity issues. Nyerere (2016) points out that even in areas where there are issues of war, conflict zones, and refugees or displaced individuals, students can still learn using ICT.

ICT is essential in the transformation of education, and challenges of access, quality, relevance, and equity continue in the education sector, as noted in the MOE's Sessional Paper No. 1 of 2019. E-learning is prioritised in the 2019 National ICT policy in the 'Mobile First' areas, where internet infrastructure connectivity is to be made accessible anywhere and anytime (National ICT Policy, 2019). With 'Mobile First' implementation, issues of access and equity would be addressed using

ODEL. In the survey done by Nyerere (2016), the results indicate that out of the 12 universities that participated in the study, 10 of the universities felt that they had made adequate efforts to reach marginalised students by using e-learning. The 2019 National ICT Policy places emphasis on bridging the digital divide by stating that by providing an all-inclusive ICT environment then it will encourage gender equality (National ICT Policy, 2019). However, the policy acknowledges challenges such as unequal investment and access to ICT in marginalised areas in Kenya, but at the same time offers solutions which include working with other organisations such as the CA to ensure that ISPs provide equitable access to all regions.

Despite the efforts by the government and private organisations, challenges of inadequate infrastructure, internet accessibility and connectivity, lack of affordable digital devices, inadequate training, and the digital divide between rural and urban areas continue to be experienced by institutions, educators, and students (Barasa, 2021). Coupled with Covid-19, institutions did not have the necessary adequate infrastructure to continue teaching, educators lacked skills, and students did not have access to the infrastructure to learn. When one considers that the MOE's National ICT Strategy for Education and Training mission is "to integrate ICT in education and training for improved access, learning and administration" (MOE, ICT, 2006:iii), where ICT is used as a mainstream tool in teaching and e-learning, then during the pandemic, if the Ministry had been working on this mission, the higher learning institutions should have operated adequately. The MOE ICT Strategy prioritised the following as strategic pillars for ICT implementation:

> Establishment of a policy framework, Digital equipment, Connectivity and network infrastructure, Technical support, Harnessing emerging technologies, Digital content development, Integration of ICTs in education, Training (capacity building including professional development), Research and development, Partnerships and resource mobilization, Legal and regulatory framework, and Monitoring and evaluation (MOE, ICT, 2006:vii)

The same policy acknowledges that the ratio of computers to university students is 1:45 and that there is a large digital divide for students in disadvantaged regions and gender disparities where girls experience more constraints. The aspects and challenges referenced in the 2006 ICT in Education policy are still the same ones acknowledged in the National ICT policy 2019.

Conclusion and Recommendations

Kenya is a leading ICT innovative hub in sub-Saharan Africa and is therefore in a position to digitize education in higher learning institutions (Barasa, 2021). It should be noted, and it is commendable, that an ICT policy exists and was recently revised in 2021, however, the implementation is still

lacking. Some of the recommendations based on the policies are, firstly, considering that most of the population is in the rural areas, the ICT policy needs to reduce the gap compared to the urban centres. In education, as noted, there are some areas where electricity and other infrastructures are limited, hence institutions of higher learning should encourage and advocate for blended and asynchronous learning. Blended learning would assist in areas where students have not understood the online content and/or when face-to-face contact is important in cases such as practical assessment. Asynchronous learning would also cater to limited infrastructures and electricity interruptions, as learners can access ICT in their own time. This calls for more lecturers and educators to be trained on ICT usage. Many educators appreciate online learning though it has its challenges, with some advocating for a hybrid or blended learning approach. Blended learning may be a solution factoring in the accessibility and equity challenges, as it would incorporate both traditional face-to-face learning and virtual learning environments. Integration of ICT in education would therefore be seamless.

Secondly, as pointed out by Fu (2013), the combination of diverse learning and teaching approaches contributes to successful learning outcomes, which play a major role in the long-term value and success of education. Also, due to technological advancements and innovative changes in the world, higher education institutions and educators need to adapt to more holistic, sustainable, and collaborative learning, so that students are competitive in the marketplace. This will impact and transform the higher education curriculum as students prepare to join current and future work environments. Therefore, the recommendation of the 'Mobile First' focus area as highlighted in the National ICT 2019 Policy, if implemented well, can help learners to access materials, as well as their instructors, in an affordable manner and with no location boundaries.

Thirdly, in all the ICT policies, partnerships with agencies are documented as necessary to address the digital divide. As noted by Farrell and Shafika (2007), ICT implementation includes support from partners in the non-governmental organisation (NGO) and private sectors. Partnerships with organizations such as the Kenya ICT Trust, KENET, the Network Initiative for Computers in Education, Microsoft, and Oracle are supporting development of the policy. More partnership initiatives need to be encouraged as digitalization generates opportunities in innovation, employment, and lifelong learners. These partnerships should not only focus on infrastructure but also equity aspects to cater to students from different backgrounds and learning environments. Accessibility and equity also extend to universal design for learning disability. Additionally, in situations where these partnerships

are available, educators need to be trained on ICT infrastructure usage and capabilities to use them effectively and efficiently as they impart knowledge to students.

Fourthly, long-term value is a holistic measure of quality and success beyond the classroom (Krishnan, 2020). Fu (2013) notes some of the benefits of using ICT in education as a creative learning environment translates into new ways of understanding and innovative ways of learning. Fu adds that there is collaborative learning with no boundaries as students analyse, explore ideas, develop concepts in a diverse learning environment, acquire critical thinking skills, and high levels of cognition. In reality, the integration of ICT in education is a mediational and evolving process (Fu, 2013). E-learning theories using any of the three theoretical levels discussed in this paper can assist educators, students, and policy makers in ensuring that ICT in education is a success. As UNESCO (2017) and scholars such as Winn (2018) and Burgess and Williams (2022) suggest, ICT policy needs to consider aspects of accessibility and equity. Based on the online learning environment, learners and educators can be encouraged to adhere to activity (empiricist), individual learner (cognitive) or interactive (summative) perspectives contingent upon the subject matter.

Finally, it is commendable that the current 2021 ICT Policy focuses on education and training. However, it would be advisable to break it down to different levels such as primary, secondary, and university or college levels, as the needs at each one are quite different. Educators at each level can focus on areas important to their students. For instance, for ICT at the primary school level, the educators can focus on introducing the learners to introductory concepts and usage of ICT, while at the university level, the educators can focus on creative and innovative ways of engaging the students to be lifelong learners while using ICT. Though significant efforts and improvements have been done in ICT integration into education, the challenges and barriers noted since 2006 continue to be the same in 2021, as noted in the policies.

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References

Barasa, P. L. (2021). Digitalization in teaching and education in Kenya: Digitalization, the future of work and the teaching profession project. International Labour Organization. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=t-jZVrgAAAAJ&citation_for_view=t-jZVrgAAAAJ:mVmsd5A6BfQC.

Brush, T., Glazewski, K. D. & Hew, K. F. (2008). Development of an instrument to measure preservice teachers' technology skills, technology beliefs, and technology barriers. *Computers in the Schools*. 25(1-2): 112-125.

Burgess, T. & Patterson Williams, A. (2022). Utilizing theory to elucidate the work of creating equity for transformation within the science classroom. *Science Education*. 106(5): 1071-1083.

Castro Sánchez, J. J. & Alemán, E. C. (2011). Teachers' opinion survey on the use of ICT tools to support attendance-based teaching. *Journal Computers and Education*. 56(3) 911-915.

Chen, C. H. (2008). Why do teachers not practice what they believe regarding technology integration? *Journal of Educational Research*.102:65-75.

Communications Authority of Kenya (CA). (2022). Annual Report and Financial Statements 2020- 2021. Available online at: https://www.ca.go.ke/wp-content/uploads/2022/04/Annual- Report-for-the-Financial-Year-2020-2021.pdf

Farrell, G. (2007). ICT in Education in Kenya. Survey of ICT and Education in Africa: Kenya Country Report. April. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://documents1.worldbank.org/curated/en/616481468047703710/pdf/463850BRI0Box31ya010ICTed0Survey111.pdf

Farrell, G. & Shafika, I. (2007). Survey of ICT and Education in Africa: A Summary Report, Based on 53 Country Surveys. Washington, DC: infoDev / World Bank. Available at http://www.infodev.org/en/Publication.353.html

Fu, Jo S. (2013). ICT in education: A critical literature review and its implications. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*. 91) 112-125

Garrison, D. R. (2011). *E-learning in the 21st Century: A Framework for Research and Practice.* (2nd ed.). New York: Taylor & Francis.

Greeno, J.G., Collins, A.M. & Resnick, L. (1996) Cognition and learning. In Berliner, D.C. & Calfee, R.C. (Eds). *Handbook of Educational Psychology*. NY: Simon & Schuster Macmillan.

Hornack, A. M. (2011). Technology integration matrix. *Recuperado de: https://bit. ly/2wOh4jx*.

Insider, M. & Insider, B. (2019). Global Edtech investments reach a staggering $18.66 billion. Markets Insider. https://markets.businessinsider.com/news/stocks/2019-global-edtech-investments-reach-a-staggering-18-66-billion-1028800669.

Kenya Education Network (KENET). (2021). Home. Available: https://www.kenet.or.ke/ Accessed 29 November 2021.

Kenya Institute of Curriculum Development (KICD). (2017). Basic education curriculum framework https://kicd.ac.ke/wp-content/uploads/2017/10/CURRICULUMFRAMEWORK.pdf

Kenya National Bureau of Statistics. (2021). Economic Survey, 2021. Nairobi: Kenya National Bureau of Statistics.

Kirui, J. K. & Sang, H.C. (2020). Rethinking quality and relevance of university education in Kenya: Entrepreneurial dimension. *The Journal of Quality in Education*. 10(16): 144-164.

Krishnan, K. (2020). Our education system is losing relevance. Here's how to unleash its potential. In World Economic Forum. Available at: https://www.weforum.org/agenda/2020/04/our-education-system-is-losing-relevance-heres-how-to-update-it/

Li, C. & Lalani, F. (2020). The COVID-19 crisis has changed education forever. This is how. In World Economic Forum. https://www. weforum. org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/

Mayes, T. & de Freitas, S. (2004). JISC e-learning models desk study. Stage 2: Review of e-learning theories, frameworks and models. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.csus.edu/indiv/s/stonerm/mayes-defreitas--e-learningmodels-complaurillardppt.pdf.

Ministry of Education (2019). Ministry of Education Sessional Paper No. 1 of 2019. A Policy Framework for Reforming Education and Training for Sustainable Development in Kenya: Towards Realizing Quality, Relevant and Inclusive Education and Training for Sustainable Development.

Ministry of Education (2021). Policy on Information and Communication Technology in Education and Training.

Ministry of Education, Science and Technology (MOEST)[Kenya]. (2015). National Education Sector Plan (NESP). Volume One: Basic Education Programme Rationale and Approach (2013–2018).

National ICT Policy. (2006). Ministry of Information and Communications. http://www.information.go.ke/docs/ICT%20Policy.pdf.

National ICT Policy. (2019). Ministry of Information and Communications. https://www.ict.go.ke/wp-content/uploads/2019/12/NATIONAL-ICT-POLICY-2019.pdf.

Nyaboke, R., Kereri, D. & Nyabwari, L. (2021). Competence-based curriculum (CBC) in Kenya and the challenge of vision 2030. *International Journal of Education, Technology and Science*. 1(4): 155-169.

Nyerere, J. (2016). Open and distance learning in Kenya: A baseline survey report commissioned by the Commonwealth of Learning.

OECD. (2021). *21st-century Readers: Developing Literacy Skills in a Digital World.* Paris: PISA, OECD Publishing.

Republic of Kenya. (2005). Sessional Paper No. 1 of 2005 on a Policy Framework for Education, Training and Research: Meeting the Challenges of Education, Training and Research in Kenya in the 21st century.

Seale, J. & Cooper, M. (2010). E-learning and accessibility: An exploration of the potential role of generic pedagogical tools. *Computers & Education*. 54(4): 1107-1116.

Seldon, A. & Abidoye, O. (2018). *The Fourth Education Revolution. Will Artificial Intelligence Liberate or Infantilise Humanity*. London: Legend Press Ltd.

Sifuna, D.N. (1998). The governance of Kenyan public universities. *Research in Post-Compulsory Education*, 3 (2): 175-212.

Souter, D. & Kerretts-Makau, M. (2012). Internet governance in Kenya - an assessment. London: A report for the Internet Society by ICT Development Associates Ltd at: http://www. internetsociety. org/sites/default/files/ISOC% 20study% 20of% 20IG% 20in% 20Kenya.

Tarus, J.K., Gichoya, D. & Muumbo, A. (2015). Challenges of implementing e-learning in Kenya: A case of Kenyan public universities. *The International Review of Research in Open and Distributed Learning*. 16(1).

Technology Integration Matrix. (2009). A video resource supporting the full integration of technology in Florida schools. Retrieved from http://www.fcit.usf.edu/matrix/

UNESCO. (2017). A guide for ensuring inclusion and equity in education. *Geneva: UNESCO IBE. https://unesd oc.unesco. org/ark:/48223/pf000, 2482*, 54.

Winn, M. T. (2018). Justice on Both Sides: *Transforming Education Through Restorative Justice*. Cambridge, Mass: Harvard Education Press.